UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Northwest and Alaska Fisheries Center
Resource Assessment and Conservation
Engineering Division
2725 Montlake Boulevard East
Seattle, WA 98112

December 28, 1983

CRUISE RESULTS

NOAA R/V CHAPMAN
Cruise CH 83-03

R/V ALASKA
AK 83-01

Cruise Period

NOAA R/V CHAPMAN - 3 June 1983 - 13 August 1983

R/V ALASKA - 3 June - 13 August 1983

Itinerary

The NOAA research vessel CHAPMAN departed Kodiak, Alaska on 3 June 1983 to begin the first leg of its portion of the eastern Bering Sea crab-groundfish survey. Intervening port calls were made to Dutch Harbor, Alaska to load equipment and exchange scientific personnel on 28-30 June and 21-23 July. A total of 45 days were spent conducting fishing operations; 12 days were spent in transit; 7 days were lost to weather and 4 days were spent in port. Bad weather and mechanical failures of the vessel during the third leg of the survey caused the early disembarkment of scientific personnel from St. Paul Island, Alaska on 9 August 1983.

The chartered vessel ALASKA also departed Kodiak, Alaska on 3 June 1983 and port calls were made to Dutch Harbor, Alaska on 27-29 June and 21-23 July to exchange scientific personnel. Fishing operations were conducted on 44 days; 11 days were spent in transit; 9 days were lost to weather and 4 days were spent in port. The scientific portion of the survey terminated on 9 August with the disembarkment of the scientific personnel from St. Paul Island, Alaska.

Area Surveyed

The survey area covered eastern Bering Sea continental shelf waters from Unimak Pass north along the 100-fathom contour line to approximately 61°N latitude and east to the Alaska mainland. The study region encompassed the major distributional area of commercially important demersal fish and shellfish stocks. Trawling stations were uniformly established on the basis of the standard 20 x 20 mile grid (1 station per 400 nm^2) that has been used in earlier Bering Sea surveys (Figure 1). Station density was increased around St. Matthew and the Pribilof Islands to provide greater sampling of blue king crab stocks of those areas.

The 1983 survey was planned as a cooperative survey with the U.S.S.R. fishery research agency, TINRO. Preliminary plans were to have the U.S.S.R. research vessel MILOGRADOVO extend the U.S. survey area by sampling the shelf region west of the U.S.- U.S.S.R. convention line; however, the U.S.S.R. vessel only surveyed the same region as U.S. vessels.

Primary Objectives

The primary objectives of the survey were to:

1. continue the annual series of assessment surveys of crab and groundfish in the eastern Bering Sea;

2. collect biological information on crab and groundfish species in the described shelf survey area;

3. collect seawater temperature and salinity data using CSTD (conductivity, salinity, temperature, depth) equipment at all stations trawled by the CHAPMAN and collect temperature data using XBT (expendable bathythermograph temperature) probes and surface bucket thermometers at all stations trawled by the ALASKA;

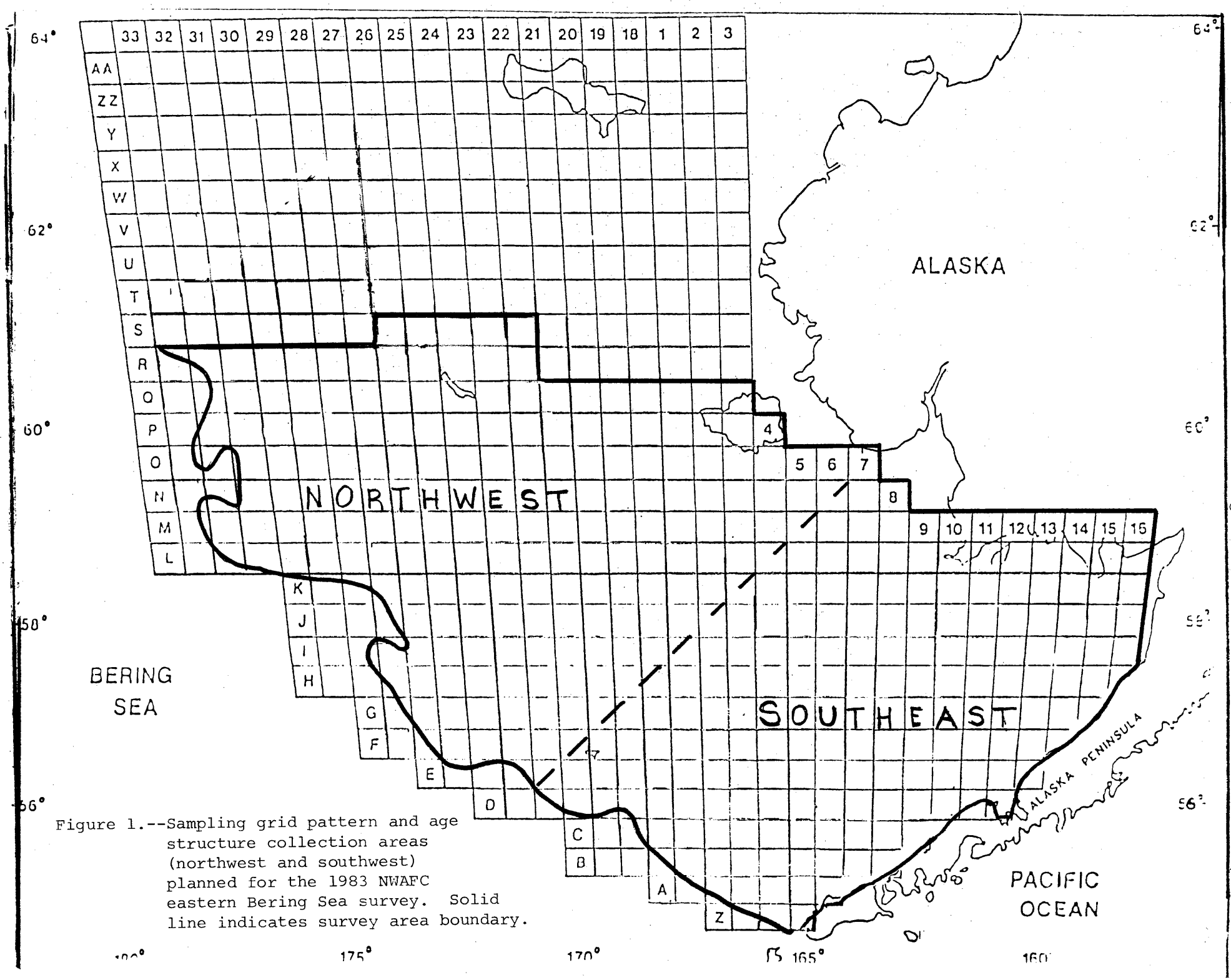


Figure 1.--Sampling grid pattern and age structure collection areas (northwest and southwest) planned for the 1983 NWAFC eastern Bering Sea survey. Solid line indicates survey area boundary.

4. conduct side-by-side comparative fishing experiments between the ALASKA and the CHAPMAN to examine the efficiency of the trawl used in 1982 and 1983 with trawls used in previous years,

5. conduct trawl gear performance observations with hydroacoustic mensuration instruments.

Secondary Objectives

Other objectives were to:

1. collect and preserve stomach contents of various species of fish for community structure and king crab predator studies;

2. continue Pacific cod tagging studies;

3. collect flathead sole and Bering flounder specimens for taxonomic examinations;

4. collect arrowtooth and Kamchatka flounder specimens for flesh quality studies by the Technology Services Branch of Canada, and

5. collect shrimp and crab specimens for special studies by the Kodiak laboratory.

Gear

The modified 83-112 otter trawl was used at all survey stations occupied by the CHAPMAN and the ALASKA. Gear configurations for the modified and standard 83-112 otter trawls are shown in Figures 2 and 3. The modifications were initially made to improve the net's bottom-tending characteristics during the 1982 crab-groundfish survey. These modifications included altering the dandylines configuration and placing 24-inch chain extensions between each end of the footrope and lower dandylines.

The modified 83-112 had a 112' footrope and 83' headrope with 4" mesh in the wings and body, 3 1/2" mesh in the intermediate, and 1 1/2" mesh in the codend liner. There were 41 floats on the headrope. Gear mensuration equipment measured the mean effective path width to be approximately 54 ft.

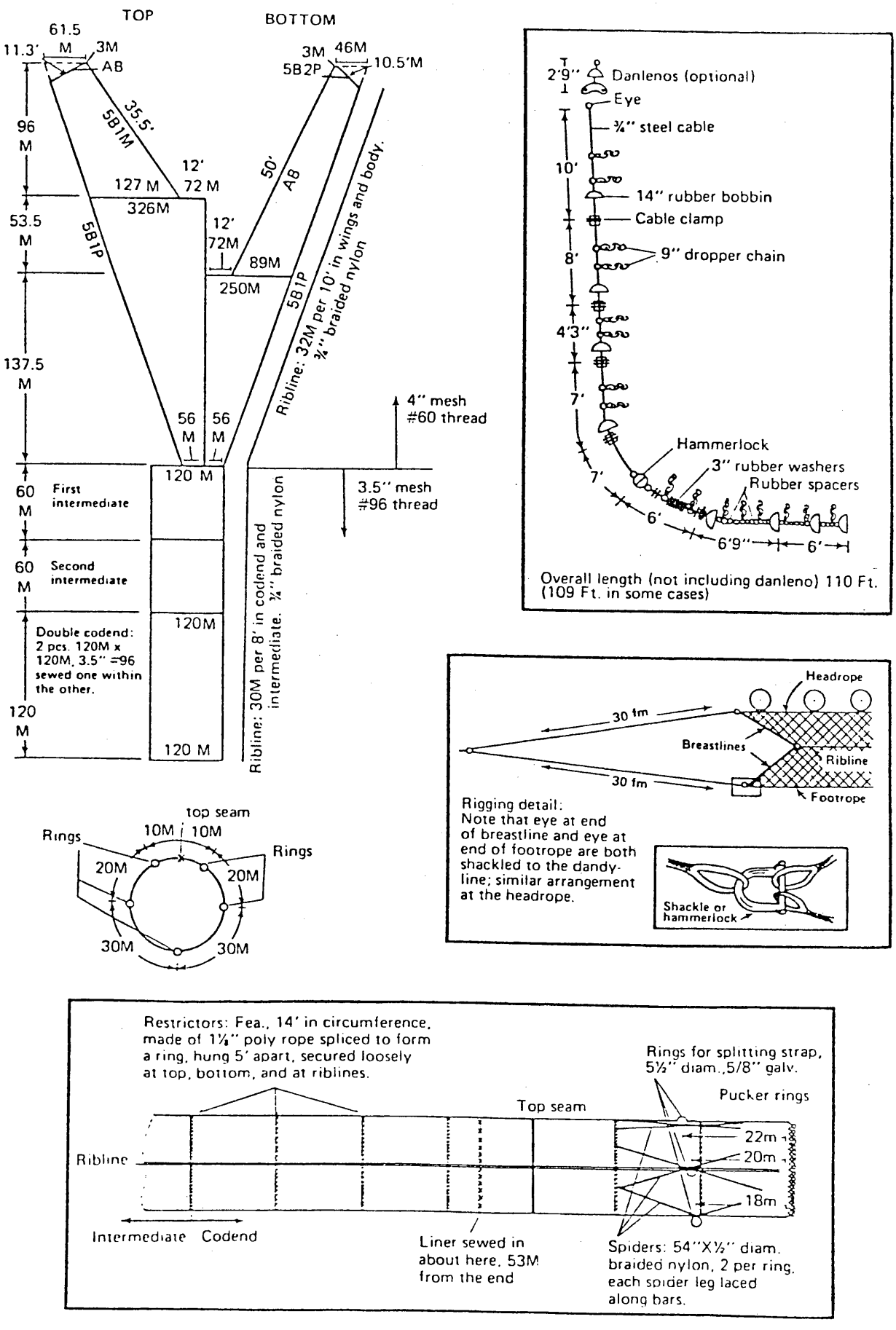
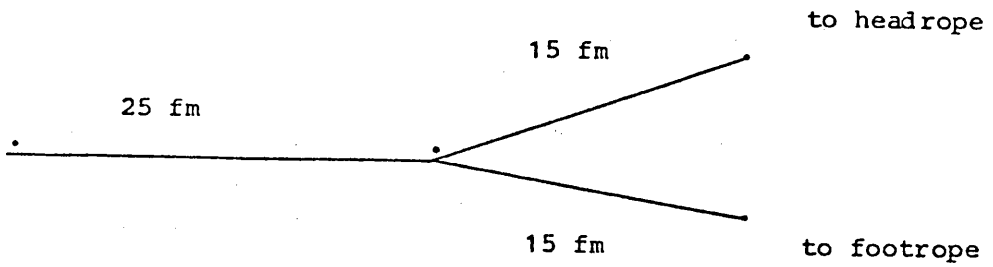


Figure 2.--Diagram of the 83-112 demersal trawl.

1981 Configuration



1982 Configuration also used at standard sampling stations during 1983

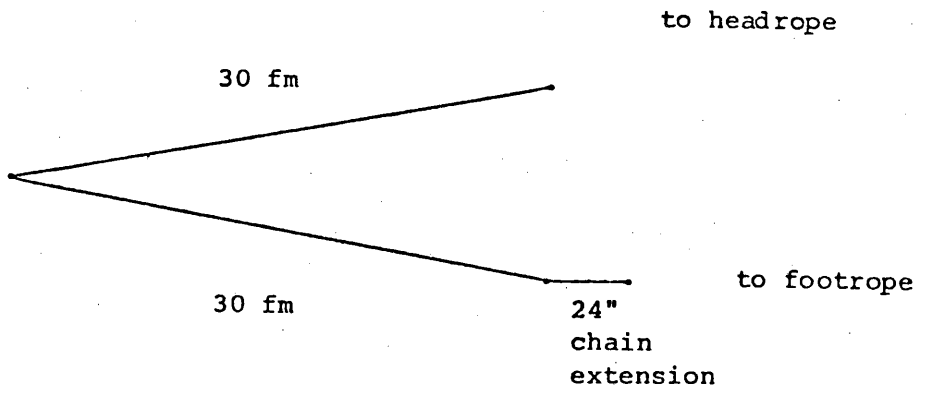


Figure 3.--Dandyline configurations used during the 1981-83 eastern Bering Sea crab-groundfish surveys.

for both vessels. The mean vertical opening of the trawl was 7.1 ft on the CHAPMAN and 9.7 ft on the ALASKA. Steel V-doors used by both vessels were 6 ft by 9 ft.

Methods

Standard sampling methods from previous years were used. A 30-minute bottom trawl haul was conducted at each station. Surface and bottom water temperatures were taken at each station using CSTD's on the CHAPMAN, and XBT probes and bucket thermometers on the ALASKA.

Catches weighing less than approximately 2,500 lb. were entirely sorted and processed. Catches weighing more than the 2,500 lb. capacity of the sorting table were subsampled. Commercially important crab species and Pacific halibut were completely removed from every catch. After the catch or subsampled portion of the catch was sorted into baskets, all species or species groups were weighed, enumerated and either discarded overboard or saved for subsequent biological sampling.

Additional biological collections included size composition by sex and/or age structures from:

Pollock (*Theragra chalcogramma*)

Yellowfin sole (*Limanda aspera*)

Rock sole (*Lepidopsetta bilineata*)

Pacific halibut (*Hippoglossus stenolepis*)

Pacific cod (*Gadus macrocephalus*)

Sablefish (*Anoplopoma fimbria*)

Pacific herring (*Clupea harengus pallasi*)

Arrowtooth flounder (*Atheresthes stomias*)

Alaska plaice (*Pleuronectes quadrituberculatus*)

Greenland turbot (*Reinhardtius hippoglossoides*)

Flathead sole (*Hippoglossoides elassodon*)

Total weights and numbers were determined for king and tanner crab. All individuals were measured when the crab catch was small. A representative subsample, or approximately 300 crabs, were processed from very large crab catches. In addition to carapace measurements, shell condition, clutch size, and egg condition were also recorded. Tanner crabs were examined for the presence of "blackmat" disease.

Two age structure collection areas (southeast and northwest) were established (Figure 1) to examine differences in age composition and growth rates of selected fish species by region. Otoliths were stored and recorded individually to allow for comparisons with fishery age data and to examine short term growth.

The CHAPMAN and ALASKA fished alternate north-south rows of standard stations providing data for the comparisons of relative fishing powers between the two vessels (Figure 4).

After the completion of all standard survey stations, gear comparison studies were conducted between the CHAPMAN and ALASKA to obtain data on the efficiency of the 83-112 trawl used in 1982 and 1983 relative to trawls used in previous years. The ALASKA fished the 400 mesh eastern bottom trawl as rigged during the 1982 and earlier surveys, while the CHAPMAN alternately towed the 83-112 eastern bottom trawl as rigged during the 1981 survey and as rigged during the 1982 and 1983 surveys.

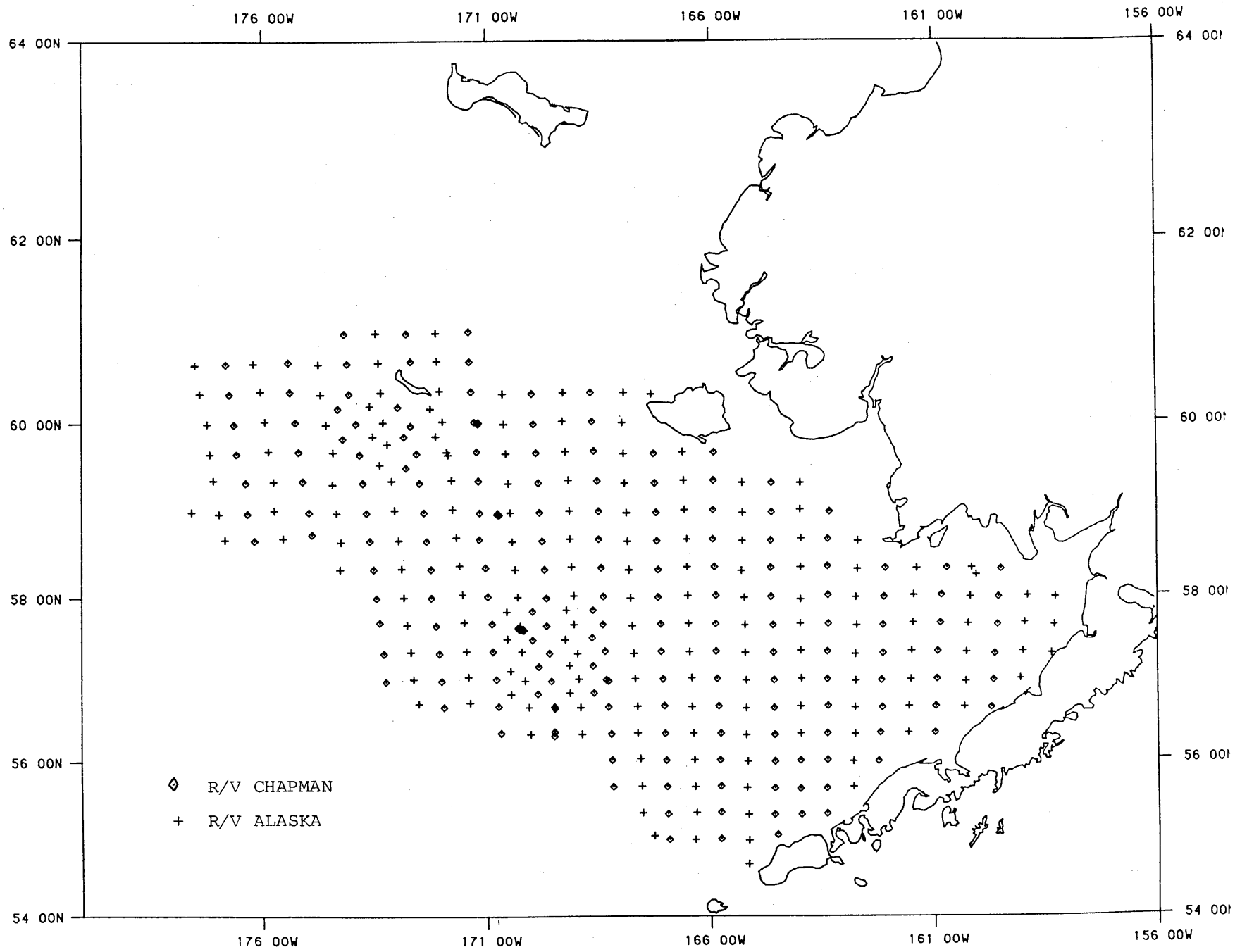


Figure 4.--Standard stations completed by the CHAPMAN and ALASKA and during the 1983 eastern Bering Sea crab groundfish survey.

RESULTS

A total of 380 trawls were attempted including 336 successful hauls completed at standard stations and 21 side-by-side comparative sets between the CHAPMAN and ALASKA during the gear comparison study. The number of gear comparison hauls were limited by poor weather conditions.

Approximately 180,000 length measurements were taken by sex/cm categories from the major fish species encountered and nearly 6,000 age stucture samples were collected (Table 1).

One hundred and eleven Pacific cod were tagged and released as a continuation of the Pacific cod tagging study initiated during the previous year. Stomachs were collected from several species of fish for predator-prey and community structure studies. Bering flounder/flathead sole and arrowtooth flounder/Kamchatka flounder specimens were collected from designated areas for taxonomic and flesh quality investigations.

Rank order of abundance (kg/ha) of the 20 most abundant fish taxa taken during the 1983 survey are listed in Table 2. As in previous years, walleye pollock, yellowfin sole, and Pacific cod were the three most abundant fish species in the overall survey area.

The gadids, pollock and Pacific cod were both widely distributed throughout the survey region (Fig. 5 and 6). Pollock, however, were most abundant with an overall CPUE value of 133 kg/ha compared to 24.8 kg/ha for Pacific cod. Pollock were found in greatest concentrations in subareas 2 and 7 at depths between 100 and 200 m while Pacific cod were located in greatest abundance in strata 10 at 37.8 kg/ha.

Yellowfin sole were restricted to depths less than 100 m and ranked as the second most abundant fish species with an overall CPUE value of 86.5 kg/ha (Figure 7). Concentrations were highest in subareas 1 and 4.

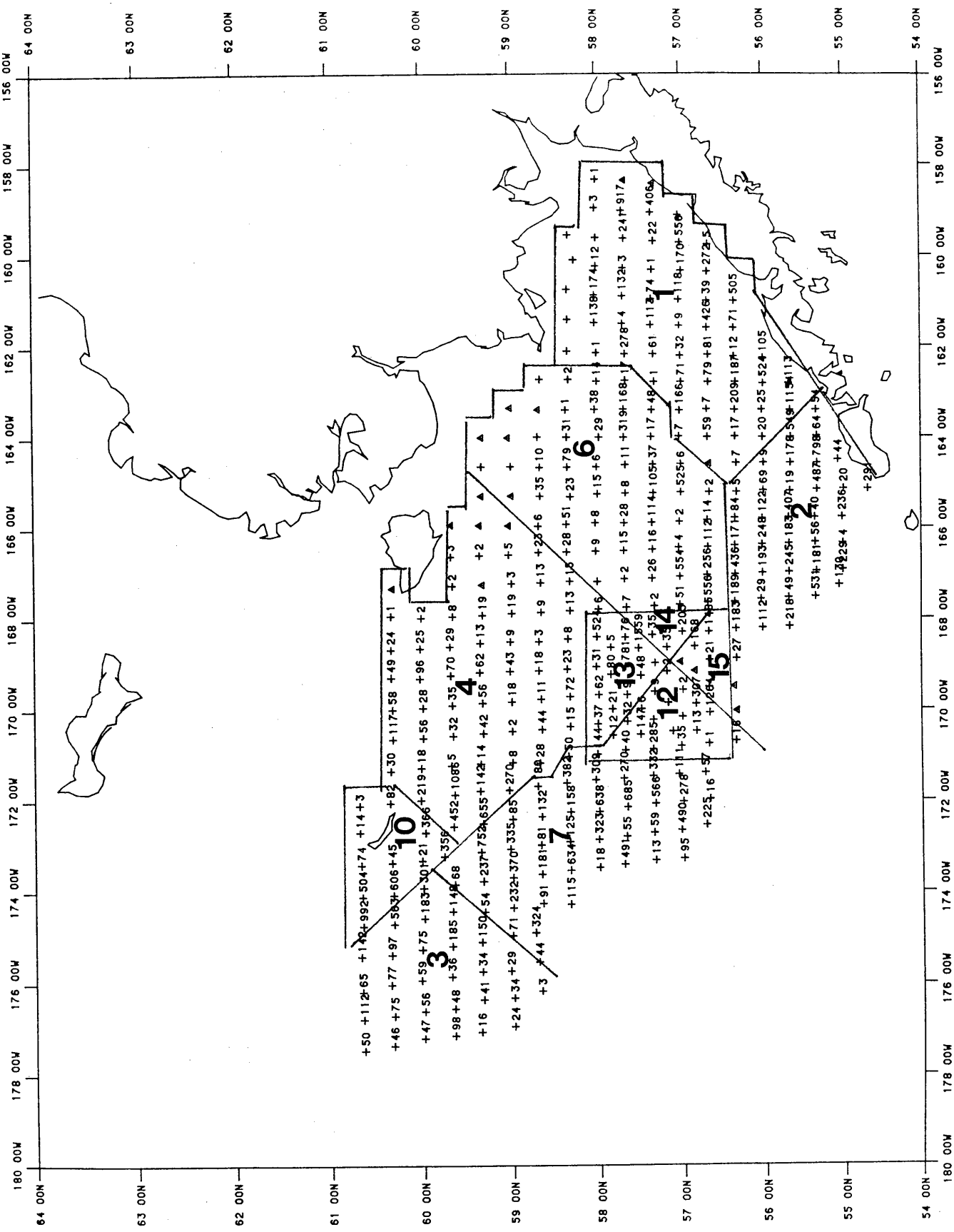
Table 1.--Number of length measurements and age structures[1/] collected from the total survey area during the 1983 eastern Bering Sea crab-groundfish survey.

Species	Number of length measurements	Number of age structures
Pollock	78,033	1,989
Pacific cod	11,353	747
Greenland turbot	951	335
Yellowfin sole	33,924	739
Rock sole	16,285	452
Alaska plaice	11,624	369
Arrowtooth flounder	6,889	593
Flathead sole	17,284	590
Pacific herring	2,202	154
Pacific halibut	996	0
Rex sole	82	0
Longhead dab	157	0
Sablefish	155	0
Saffron cod	135	0
TOTAL	180,070	5,968

1/ Scales were collected from Pacific cod less than 65 cm, scales and otoliths from cod greater than 65 cm, and scales from Pacific herring. Otoliths were collected from all other species.

Table 2.--Rank order of abundance of the 20 most abundant fish taxa taken during the 1983 eastern Bering Sea crab/ groundfish survey.

Rank	Species	CPUE (kg/ha)
1	Walleye pollock	133.0
2	Yellowfin sole	86.5
3	Pacific cod	24.8
4	Rock sole	19.0
5	Alaska plaice	16.3
6	Flathead sole	6.1
7	Arrowtooth flounder	3.3
8	Pacific halibut	2.0
9	Plain sculpin	1.7
10	Pacific herring	1.6
11	Starry skate	1.3
12	Alaska skate	1.2
13	Skate sp.	1.0
14	Butterfly sculpin	1.0
15	Longhead dab	1.0
16	Myoxocephalus sp.	1.0
17	Yellow Irish lord	0.8
18	Great sculpin	0.8
19	Greenland turbot	0.8
20	Sparse toothed lycod	0.7



Fiyure 5.--Catch per unit effort (kg/ha) of pollock during the 1983 eastern Bering Sea crab-groundfish survey.

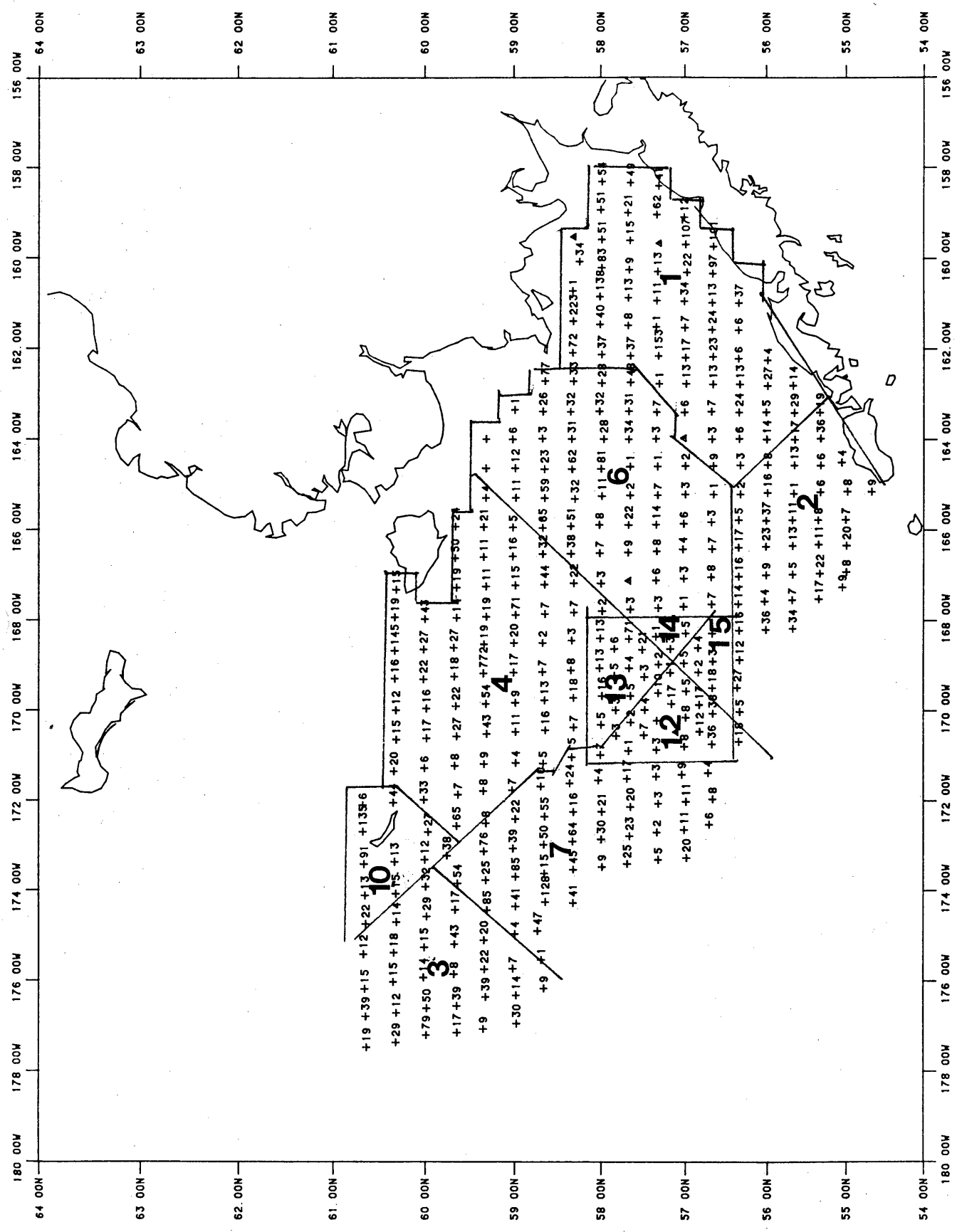
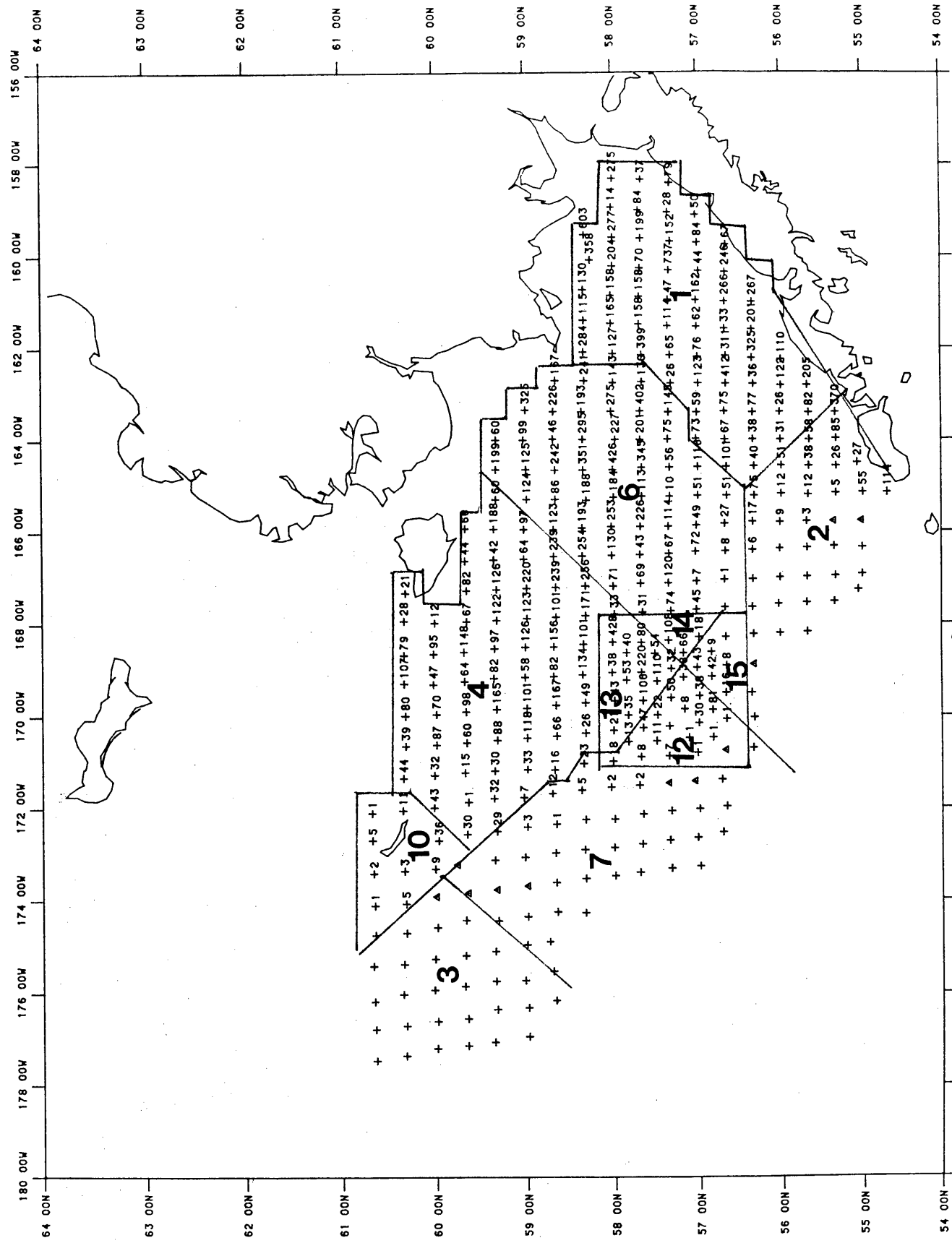


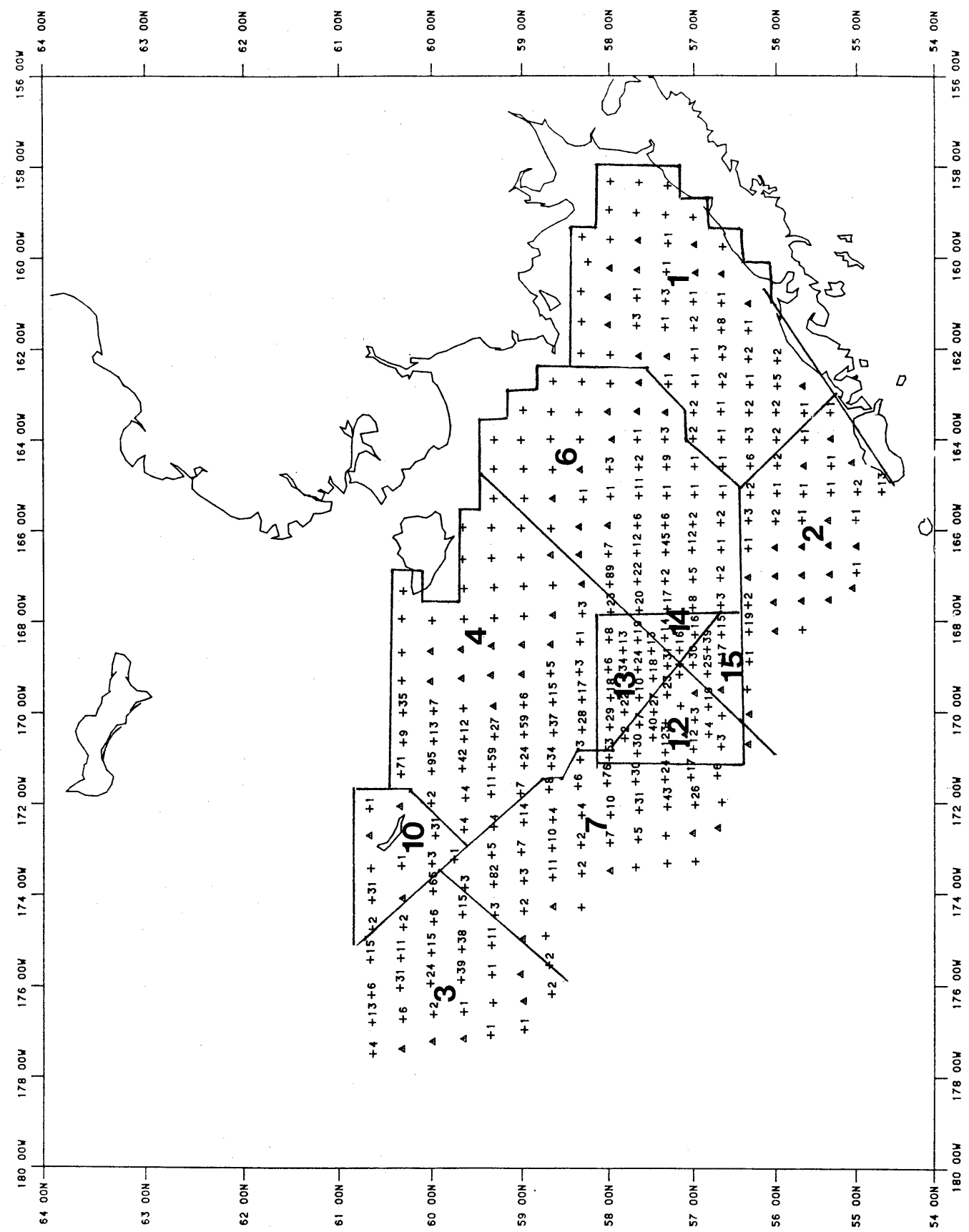
Figure 6.--Catch per unit effort (kg/ha) of Pacific cod during the 1983 eastern Bering Sea crab-groundfish survey.



Fi re 7.--Catch per unit effort (kg/ha) of yellowfi ole during the 1983 eastern Bering Sea crab-groundfish survey.

Relative distribution of Tanner crab (Chionocetes opilio and C. bairdi) are shown in Figures 8 and 9. C. opilio were encountered in all subareas with an overall CPUE value of 7.44 kg/ha; greatest concentrations were observed along the central shelf. C. bairdi were less abundant than C. opilio (overall CPUE of 1.39 kg/ha), and were mainly distributed in subareas 1, 2, and 7.

Blue king crab were encountered in the regions around St. Matthew and the Pribilof Islands, while red king crab were primarily distributed in Bristol Bay (Figures 10 and 11). The overall CPUE value for red king crab (1.12 kg/ha) was higher than for blue king crab (0.6 kg/ha).



l ure 8.--Catch per unit effort (kg/ha) of Tanner c b, C. opilio, during the 1983 eastern Bering Sea crab-groundfish survey.

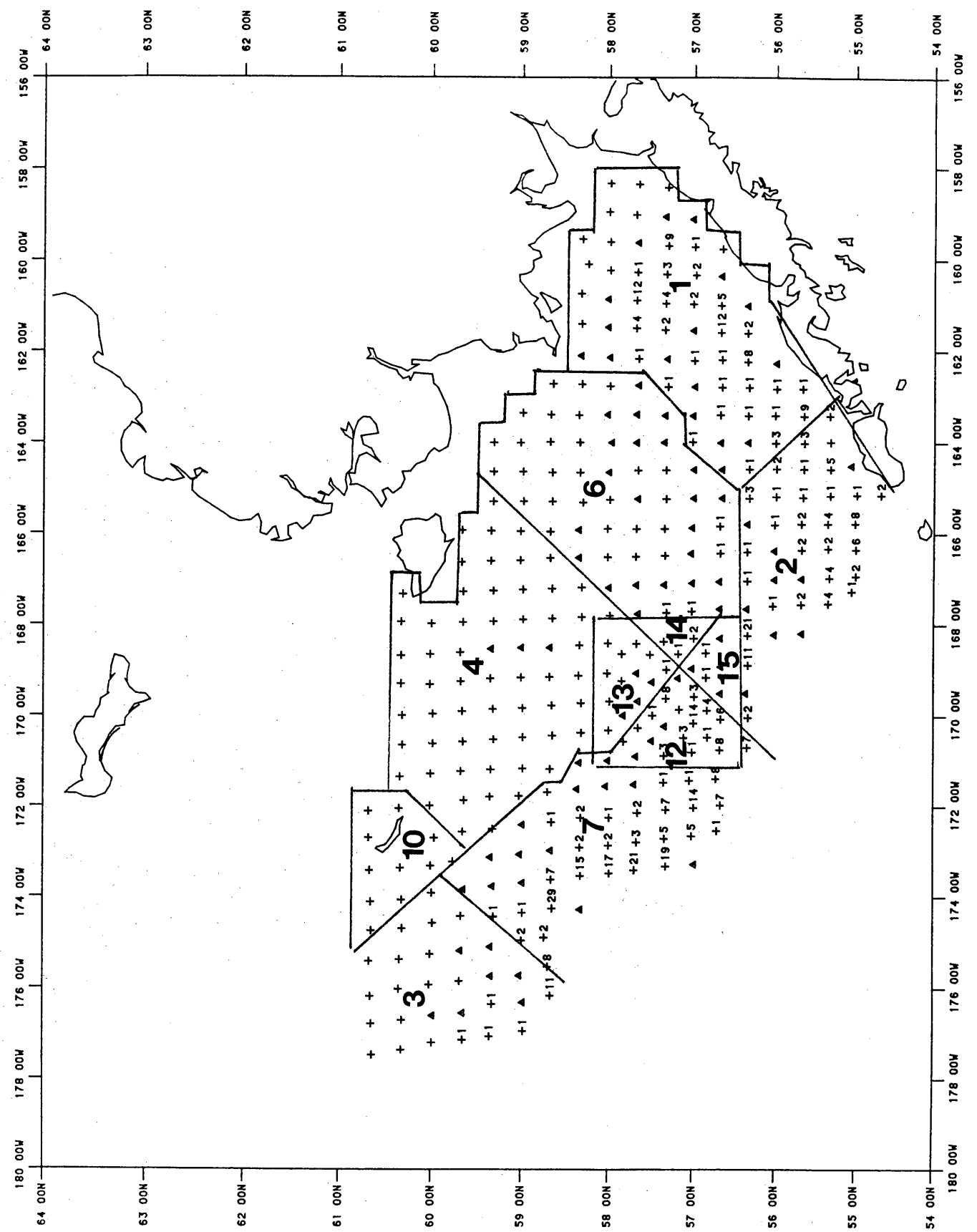


Figure 9.--Catch per unit effort (kg/ha) of Tanner crab, C. bairdi, during the 1983 eastern Bering Sea crab-groundfish survey.

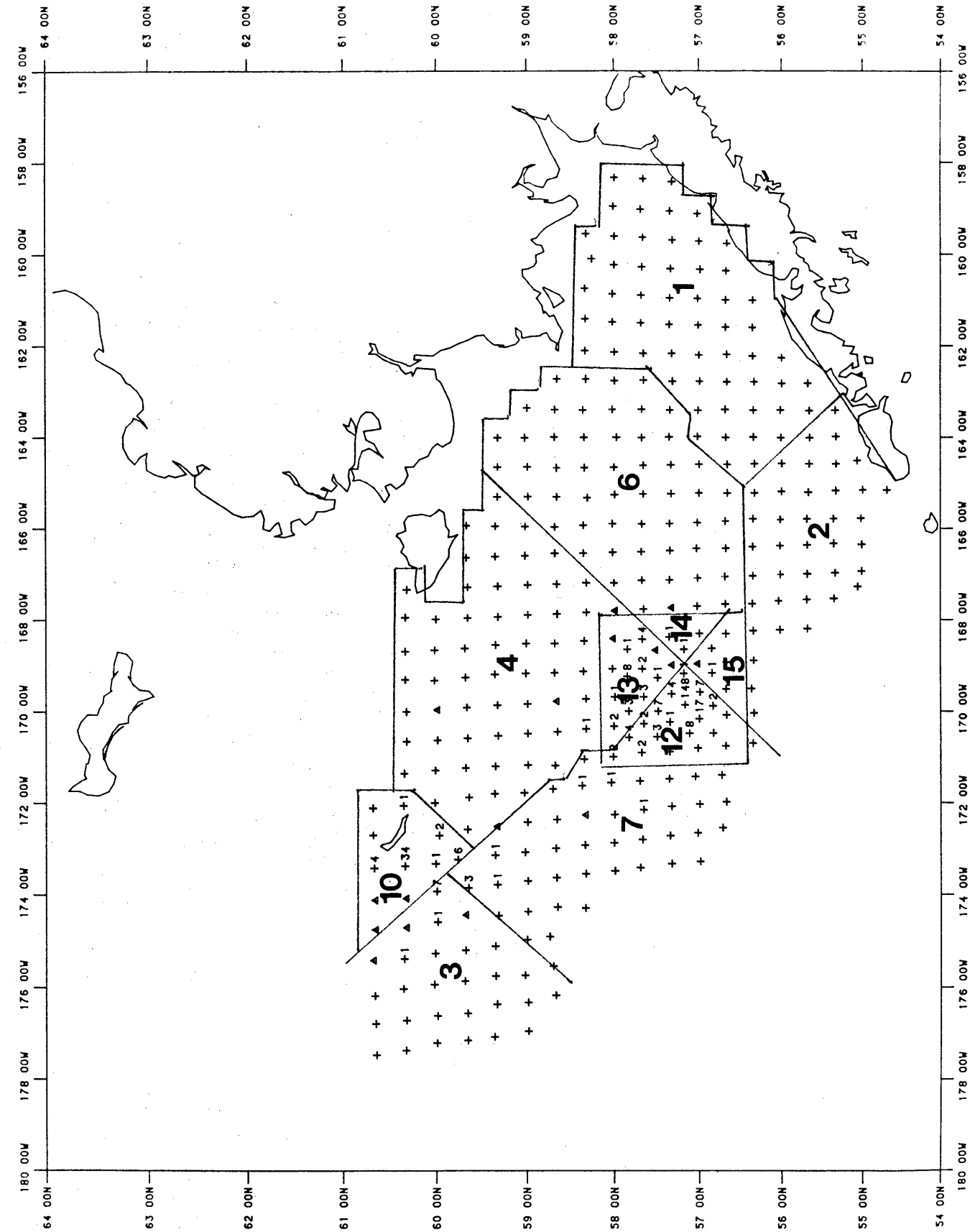


Figure 10.--Catch per unit effort (kg/ha) of bl king crab during the 1983 eastern Bering Sea crab-groundfish survey.

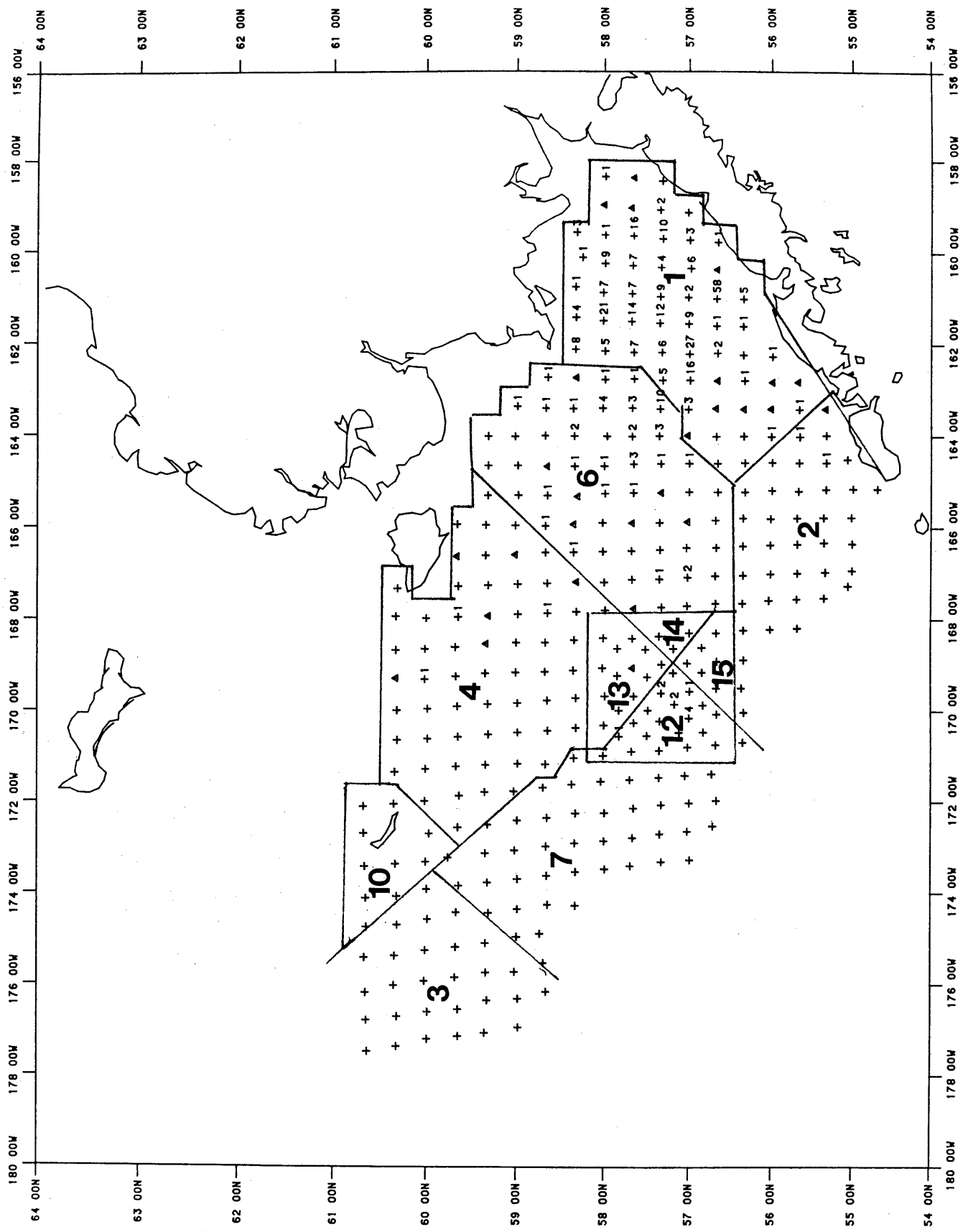


Figure 11.--Catch per unit effort (kg/ha) of red king crab during the 1983 eastern Bering Sea crab-groundfish survey.

Personnel

CHAPMAN

Leg I, June 3 - June 28

Name	Title	Organization*
Kessler, D.	Chief Scientist	NWAFC/K
Hartsock, F.	Fish. Biologist	NWAFC/K
Sample, T.	Fish. Biologist	NWAFC/S
Smith, R.	Biologist	Univ. of AK
Bohle, M.	Fish. Biologist	NWAFC/S
West. W. (1/2 of leg)	Fish. Biologist	NWAFC/S

Leg II, June 30 - July 21

June, J.	Chief Scientist	NWAFC/S
Walters, G.	Fish. Biologist	NWAFC/S
St. Pierre, G.	Fish. Biologist	IPHC
Armetta, T.	Fish. Biologist	NWAFC/K
Anderson, P.	Fish. Biologist	NWAFC/K
Morado, F.	Fish. Biologist	NWAFC/S

Leg III, July 23 - August 9

Coe J.	Chief Scientist	NWAFC/S
Livingston, P.	Fish. Biologist	NWAFC/S
St. Pierre, G.	Fish. Biologist	IPHC
Kessler, D.	Fish. Biologist	NWAFC/K
Hartsock, F.	Fish. Biologist	NWAFC/K
Halliday, K.	Fish. Biologist	NWAFC/S

ALASKA

Leg I, June 3 - June 28

Coe, J.	Chief Scientist	NWAFC/S
Raymore, P.	Fish. Biologist	NWAFC/S
Hollowed, A.	Op. Res. Analyst	NWAFC/S
Stahl, K.	Fish. Biologist	NWAFC/K
Wilson, S.	Computer Specialist	NWAFC/K
West, W. (1/2 leg)	Fish. Biolgist	NWAFC/S

Leg II, June 30 - July 21

Shimada, A.	Chief Scientist	NWAFC/S
Umeda, Y.	Fish. Biologist	NWAFC/S
Green, J.	Biologist	Univ. of AK
Yang, M.	Fish. Biologist	NWAFC/S
Meyers, S.	Fish. Biologist	NWAFC/K
Munk, E.	Fish. Biologist	NWAFC/K

Leg III, July 23 - August 9

Name	Title	Organization*
MacIntosh, R.	Chief Scientist	NWAFC/K
Allen, J.	Fish. Biologist	NWAFC/S
Bohle, M.	Fish. Biologist	NWAFC/S
Fisk, D.	Fish. Biologist	NWAFC/S
Baxter, R.	Fish. Biologist	NWAFC/K

*K = Kodiak Laboratory S = Seattle